PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2204/A90 WO	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US01/25520	International filing date *(day/month/year)* 15 August 2001 (15.08.2001)	Priority date *(day/month/year)* 15 August 2000 (15.08.2000)
International Patent Classification (IPC) or national classification and IPC IPC(7): H04J 14/02 and US Cl.: 359/128		
Applicant NORTEL NETWORKS LIMITED		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 9 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
15 March 2002 (15.03.2002)	17 October 2002 (17.10.2002)
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer Jason Chan Telephone No. 703-305-4700

Form PCT/IPEA/409 (cover sheet)(July 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US01/25520

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed.

☒ the description:
pages 1-24 as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____.

☒ the claims:
pages NONE, as originally filed
pages NONE, as amended (together with any statement) under Article 19
pages NONE, filed with the demand
pages 25-33, filed with the letter of 27 August 2002 (27.08.2002)

☒ the drawings:
pages 1-10, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____.

☐ the sequence listing part of the description:
pages NONE, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____.

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination(under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

☐ the description, pages NONE

☒ the claims, Nos. 40-52

☐ the drawings, sheets/~~fig~~ NONE

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

** Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

*** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US01/25520

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. STATEMENT

Novelty (N)	Claims	37-39	YES
	Claims	NONE	NO
Inventive Step (IS)	Claims	NONE	YES
	Claims	1-39	NO
Industrial Applicability (IA)	Claims	1-39	YES
	Claims	NONE	NO

2. CITATIONS AND EXPLANATIONS

Please See Continuation Sheet

VIII. Certain observations n the international application

The following observations on the clarity of the claims, description, and drawings or on the questions whether the claims are fully supported by the description, are made:

Claim 24 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claim 24 is indefinite for the following reason(s): Claim 24 recites "the networking device" in line 1 of the claim. There is insufficient antecedent basis for that limitation, since claim 13, on which claim 24 depends, does not specifically recite "a networking device."

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(To be used when the space in any of the preceding boxes is not sufficient)

V. 2. Citations and Explanations:

Claims 37-39 lack novelty under PCT Article 33(2) as being anticipated by Fevrier et al. (US 5,612,805 A).

Regarding claim 37, Fevrier et al. disclose a method for multicasting in an optical communication system (Figure 3), the method comprising:

receiving an optical data stream including multicast traffic;

terminating the optical data stream (by dropping some signals); and

routing the multicast traffic using a predetermined multicast routing mechanism (column 5, lines 5-67; column 6, lines 1-59).

Regarding claim 38, Fevrier et al. disclose that receiving the optical data stream including multicast traffic comprises receiving the optical data stream over an incoming optical fiber.

Regarding claim 39, Fevrier et al. disclose that terminating the optical data stream comprises:

dropping the optical data stream from the incoming optical fiber; and

converting the multicast traffic from an optical form into a digital form suitable for routing (Figure 3).

Claims 1-36 lack an inventive step under PCT Article 33(3) as being obvious over McGuire (US 5,889,600 A)

Regarding claims 1 and 13, McGuire discloses a networking device or a system (Figure 1) comprising:

a number of incoming optical interfaces (splitters which receive input from fibers 1-3) for receiving incoming optical data streams from a number of incoming optical fibers;

a number of outgoing optical interfaces (combiners 9-11) for directing outgoing optical data streams to a number of outgoing optical fibers;

a number of digital interfaces (transmitters 7 and photodetectors 8) for sending and receiving digitally formatted information;

optical switching logic X1-4 for switching optical data streams; and

digital routing logic for routing digitally formatted information (McGuire discloses that electrical signals may be processed in a lower layer of the system and may be transmitted to or received from the optical layer as necessary; column 1, lines 26-67; column 2, lines 1-9), wherein:

the optical switching logic is operably coupled to receive the incoming optical data streams (at ports "a" through "c") from the incoming optical interfaces and to selectively pass each incoming optical data stream (at ports "e" through "h") through to an outgoing optical interface or divert the incoming optical data stream to the digital routing logic; and

the optical switching logic is operably coupled to receive digitally formatted information (at ports "d") from the digital routing logic and to output the digitally formatted information received from the digital routing logic to the outgoing optical interfaces in the form of a number of outgoing optical data streams.

McGuire further discloses that the digital routing logic is operably coupled to receive digitally formatted information from the digital interfaces and from the optical switching logic (received via photodetectors 8) and to route the digitally formatted

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information to the digital interfaces and to the optical switching logic according to a routing mechanism (such as a management unit which applies control signals to the switching logic; column 1, lines 39-44).

McGuire does not specifically disclose that the routing of the information is based upon addressing information in the digitally formatted information, but it is well known in the art that information signals may carry addressing information so that the signals may be correctly routed to a desired destination. It would have been obvious to a person of ordinary skill in the art to use addressing information in the information signals to route the signals in order to properly direct the signals to their destinations.

Regarding claim 25, McGuire discloses device (Figure 1) comprising:

a router interface (transmitters 7 and photodetectors 8) for exchanging digitally formatted information with the digital routing logic; and

optical switching logic X1...4 operably coupled to selectively switch each of a number of incoming optical data streams received over a number of incoming optical interfaces (such as the splitters shown in Figure 1 which receive signals from fibers 1-3) to either one of a number of outgoing optical interfaces (such as combiners 9-11 shown in Figure 1) or the router interface (photodetectors 8) and to selectively switch digitally formatted information received over the router interface to the outgoing optical interfaces in the form of outgoing optical data streams.

McGuire discloses that the device may be included in a system further including digital routing logic for routing digitally formatted information (McGuire discloses that electrical signals may be processed in a lower layer of the system and may be transmitted to or received from the optical layer as necessary; column 1, lines 26-67; column 2, lines 1-9). McGuire does not specifically disclose that the device may be an optical line card, but such cards are well known in the art as a type of hardware for provide switching and routing functions. It would have been obvious to a person of ordinary skill in the art to specifically manufacture the system disclosed by McGuire as an optical line card in order to allow it to be used in existing network hardware arrangements.

Regarding claims 2, 14, and 26, McGuire discloses that each incoming optical fiber comprises a plurality of incoming optical data streams at different wavelengths, and wherein the optical switching logic comprises demultiplexing logic (such as filters F1-1...3) operably coupled to demultiplex the plurality of incoming optical data streams from each incoming optical fiber via the incoming optical interfaces.

Regarding claims 3, 15, and 27, McGuire discloses that the optical switching logic comprises an optical switch (such as switches X1-4) operably to selectively pass each incoming optical data stream through to the outgoing optical interfaces or divert the incoming optical data stream to the digital routing logic.

Regarding claims 4, 16, and 28, McGuire discloses that the optical switch comprises an optical add/drop fabric capable of passing through selected optical data streams from the incoming optical interfaces to the outgoing optical interfaces, diverting selected optical data streams from the incoming optical interfaces to the digital routing logic (through ports "h"), and directing outgoing optical data streams from the digital routing logic (through ports "d") to the outgoing optical interfaces.

Regarding claims 5, 17, and 29, McGuire does not specifically disclose that the optical switch comprises an optical drop-only fabric. However, McGuire does disclose that the optical switch may drop signals as well as add signals. It would have been obvious to a person of ordinary skill in the art to specifically have a drop-only fabric in the system disclosed by Liu et al. simply as an engineering design choice to save costs and reduce complexity if the network the system was used in did not require adding signals.

Regarding claims 6, 18, and 30, McGuire discloses that the optical switching logic comprises a number of optical receivers 8 operably coupled to convert each diverted incoming optical data stream into digitally formatted information for processing by the digital routing logic.

Regarding claims 7, 19, and 31, McGuire discloses that the optical switching logic comprises a number of optical transmitters 7 operably coupled to convert the digitally formatted information received from the digital routing logic into a number of outgoing optical data streams at predetermined wavelengths.

Regarding claims 8, 9, 20, 21, 32, and 33, McGuire discloses that the transmitters 7 in Figure 1 produce an outgoing optical data stream at a predetermined wavelength but does not specifically disclose that the transmitters comprise fixed wavelength or tunable lasers. However, it is well known in the art that fixed wavelength lasers may be used in an optical transmitter to generate optical data signals, and it is also well known in the art that tunable lasers may be used instead in order to provide a more flexible system, as McGuire already suggests (column 4, lines 18-27). It would have been obvious to a person of ordinary skill in the art to use either fixed wavelength or tunable lasers in the transmitters disclosed by McGuire as an engineering design choice of a way to provide the optical data signals McGuire already discloses.

Regarding claims 10, 22, and 34, McGuire discloses that the optical switching logic comprises multiplexing logic (elements 9-11) operably coupled to multiplex a plurality of outgoing optical data streams onto a single outgoing optical fiber via an outgoing optical interface.

Regarding claims 11, 23, and 35, McGuire discloses that the optical switching logic comprises a combiner (elements 9-11) operably coupled to combine at least one outgoing optical data stream from the digital routing logic with at least one outgoing optical data stream pass through from an incoming optical interface onto a single outgoing optical fiber via an outgoing optical interface.

Regarding claims 12 and 24, McGuire discloses that the networking device is an optical switch router.

Regarding claim 36, McGuire does not specifically disclose that the optical interfaces are on an optical physical card but again, such cards are well known in the art. It would have been obvious to a person of ordinary skill in the art to include an optical physical card in the system disclosed by McGuire as a known hardware device for providing optical input and output and an interface for the switching device McGuire already discloses so that it would be able to communicate with the optical physical card.

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---------- NEW CITATIONS ----------
US 5,889,600 A (MCGUIRE) 30 March 1999, see Figure 1.

What is claimed is:

1. A networking device comprising:

a number of incoming optical interfaces for receiving incoming optical data streams from a number of incoming optical fibers;

a number of outgoing optical interfaces for directing outgoing optical data streams to a number of outgoing optical fibers;

a number of digital interfaces for sending and receiving digitally formatted information;

optical switching logic for switching optical data streams; and

digital routing logic for routing digitally formatted information, wherein:

the optical switching logic is operably coupled to receive the incoming optical data streams from the incoming optical interfaces and to selectively pass each incoming optical data stream through to an outgoing optical interface or divert the incoming optical data stream to the digital routing logic;

the optical switching logic is operably coupled to receive digitally formatted information from the digital routing logic and to output the digitally formatted information received from the digital routing logic to the outgoing optical interfaces in the form of a number of outgoing optical data streams;

the digital routing logic is operably coupled to receive digitally formatted information from the digital interfaces and from the optical switching logic and to route the digitally formatted information to the digital interfaces and to the optical switching logic based upon addressing information in the digitally formatted information according to a routing mechanism.

2. The networking device of claim 1, wherein each incoming optical fiber comprises a plurality of incoming optical data streams at different wavelengths, and wherein the optical switching logic comprises

demultiplexing logic operably coupled to demultiplex the plurality of incoming optical data streams from each incoming optical fiber via the incoming optical interfaces.

3. The networking device of claim 1, wherein the optical switching logic comprises an optical switch operably to selectively pass each incoming optical data stream through to the outgoing optical interfaces or divert the incoming optical data stream to the digital routing logic.

4. The networking device of claim 3, wherein the optical switch comprises an optical add/drop fabric capable of passing through selected optical data streams from the incoming optical interfaces to the outgoing optical interfaces, diverting selected optical data streams from the incoming optical interfaces to the digital routing logic, and directing outgoing optical data streams from the digital routing logic to the outgoing optical interfaces.

5. The networking device of claim 3, wherein the optical switch comprises an optical drop-only fabric capable of passing through selected optical data streams from the incoming optical interfaces to the outgoing optical interfaces and diverting selected optical data streams from the incoming optical interfaces to the digital routing logic, but not directing outgoing optical data streams from the digital routing logic to the outgoing optical interfaces.

6. The networking device of claim 1, wherein the optical switching logic comprises a number of optical receivers operably coupled to convert each diverted incoming optical data stream into digitally formatted information for processing by the digital routing logic.

7. The networking device of claim 1, wherein the optical switching logic comprises a number of optical transmitters operably coupled to convert the

digitally formatted information received from the digital routing logic into a number of outgoing optical data streams at predetermined wavelengths.

8. The networking device of claim 7, wherein an optical transmitter comprises a fixed wavelength laser for producing the outgoing optical data stream at the predetermined wavelength.

9. The networking device of claim 7, wherein an optical transmitter comprises a tunable laser tuned to produce the outgoing optical data stream at the predetermined wavelength.

10. The networking device of claim 1, wherein the optical switching logic comprises multiplexing logic operably coupled to multiplex a plurality of outgoing optical data streams onto a single outgoing optical fiber via an outgoing optical interface.

11. The networking device of claim 1, wherein the optical switching logic comprises a combiner operably coupled to combine at least one outgoing optical data stream from the digital routing logic with at least one outgoing optical data stream pass through from an incoming optical interface onto a single outgoing optical fiber via an outgoing optical interface.

12. The networking device of claim 1, wherein the networking device is an optical switch router.

13. A system comprising:

a number of incoming optical interfaces for receiving incoming optical data streams from a number of incoming optical fibers;

a number of outgoing optical interfaces for directing outgoing optical data streams to a number of outgoing optical fibers;

a number of digital interfaces for sending and receiving digitally formatted information;

optical switching logic for switching optical data streams; and

digital routing logic for routing digitally formatted information, wherein:

the optical switching logic is operably coupled to receive the incoming optical data streams from the incoming optical interfaces and to selectively pass each incoming optical data stream through to an outgoing optical interface or divert the incoming optical data stream to the digital routing logic;

the optical switching logic is operably coupled to receive digitally formatted information from the digital routing logic and to output the digitally formatted information received from the digital routing logic to the outgoing optical interfaces in the form of a number of outgoing optical data streams;

the digital routing logic is operably coupled to receive digitally formatted information from the digital interfaces and from the optical switching logic and to route the digitally formatted information to the digital interfaces and to the optical switching logic based upon addressing information in the digitally formatted information according to a routing mechanism.

14. The system of claim 13, wherein each incoming optical fiber comprises a plurality of incoming optical data streams at different wavelengths, and wherein the optical switching logic comprises demultiplexing logic operably coupled to demultiplex the plurality of incoming optical data streams from each incoming optical fiber via the incoming optical interfaces.

15. The system of claim 13, wherein the optical switching logic comprises an optical switch operably to selectively pass each incoming optical data stream through to the outgoing optical interfaces or divert the incoming optical data stream to the digital routing logic.

16. The system of claim 15, wherein the optical switch comprises an optical add/drop fabric capable of passing through selected optical data streams from the incoming optical interfaces to the outgoing optical interfaces, diverting selected optical data streams from the incoming optical interfaces to the digital routing logic, and directing outgoing optical data streams from the digital routing logic to the outgoing optical interfaces.

17. The system of claim 15, wherein the optical switch comprises an optical drop-only fabric capable of passing through selected optical data streams from the incoming optical interfaces to the outgoing optical interfaces and diverting selected optical data streams from the incoming optical interfaces to the digital routing logic, but not directing outgoing optical data streams from the digital routing logic to the outgoing optical interfaces.

18. The system of claim 13, wherein the optical switching logic comprises a number of optical receivers operably coupled to convert each diverted incoming optical data stream into digitally formatted information for processing by the digital routing logic.

19. The system of claim 13, wherein the optical switching logic comprises a number of optical transmitters operably coupled to convert the digitally formatted information received from the digital routing logic into a number of outgoing optical data streams at predetermined wavelengths.

20. The system of claim 19, wherein an optical transmitter comprises a fixed wavelength laser for producing the outgoing optical data stream at the predetermined wavelength.

21. The system of claim 19, wherein an optical transmitter comprises a tunable laser tuned to produce the outgoing optical data stream at the predetermined wavelength.

22. The system of claim 13, wherein the optical switching logic comprises multiplexing logic operably coupled to multiplex a plurality of outgoing optical data streams onto a single outgoing optical fiber via an outgoing optical interface.

23. The system of claim 13, wherein the optical switching logic comprises a combiner operably coupled to combine at least one outgoing optical data stream from the digital routing logic with at least one outgoing optical data stream pass through from an incoming optical interface onto a single outgoing optical fiber via an outgoing optical interface.

24. The system of claim 13, wherein the networking device is an optical switching/routing system.

25. An optical line card for use in a networking device having digital routing logic for routing digitally formatted information, the optical line card comprising:

a router interface for exchanging digitally formatted information with the digital routing logic; and

optical switching logic operably coupled to selectively switch each of a number of incoming optical data streams received over a number of incoming optical interfaces to either one of a number of outgoing optical interfaces or the router interface and to selectively switch digitally formatted information received over the router interface to the outgoing optical interfaces in the form of outgoing optical data streams.

26. The optical line card of claim 25, wherein each incoming optical fiber comprises a plurality of incoming optical data streams at different wavelengths, and wherein the optical switching logic comprises demultiplexing logic operably coupled to demultiplex the plurality of incoming optical data streams from each incoming optical fiber via the incoming optical interfaces.

27. The optical line card of claim 25, wherein the optical switching logic comprises an optical switch operably to selectively pass each incoming optical data stream through to the outgoing optical interfaces or divert the incoming optical data stream to the digital routing logic.

28. The optical line card of claim 27, wherein the optical switch comprises an optical add/drop fabric capable of passing through selected optical data streams from the incoming optical interfaces to the outgoing optical interfaces, diverting selected optical data streams from the incoming optical interfaces to the router interface, and directing outgoing optical data streams from the router interface to the outgoing optical interfaces.

29. The optical line card of claim 27, wherein the optical switch comprises an optical drop-only fabric capable of passing through selected optical data streams from the incoming optical interfaces to the outgoing optical interfaces and diverting selected optical data streams from the incoming optical interfaces to the router interface, but not directing outgoing optical data streams from the router interface to the outgoing optical interfaces.

30. The optical line card of claim 25, wherein the optical switching logic comprises a number of optical receivers operably coupled to convert each diverted incoming optical data stream into digitally formatted information for transmission to the digital routing logic over the router interface.

31. The optical line card of claim 25, wherein the optical switching logic comprises a number of optical transmitters operably coupled to convert the digitally formatted information received from the router interface into a number of outgoing optical data streams at predetermined wavelengths.

32. The optical line card of claim 31, wherein an optical transmitter comprises a fixed wavelength laser for producing the outgoing optical data stream at the predetermined wavelength.

33. The optical line card of claim 31, wherein an optical transmitter comprises a tunable laser tuned to produce the outgoing optical data stream at the predetermined wavelength.

34. The optical line card of claim 25, wherein the optical switching logic comprises multiplexing logic operably coupled to multiplex a plurality of outgoing optical data streams onto a single outgoing optical fiber via an outgoing optical interface.

35. The optical line card of claim 25, wherein the optical switching logic comprises a combiner operably coupled to combine at least one outgoing optical data stream from the router interface with at least one outgoing optical data stream passed through from an incoming optical interface onto a single outgoing optical fiber via an outgoing optical interface.

36. The optical line card of claim 25, wherein the incoming optical interfaces and the outgoing optical interfaces are on an optical physical card, and wherein the optical line card further comprises a physical card interface for coupling the optical switching logic to the incoming and outgoing optical interfaces.

37. A method for multicasting in an optical communication system, the method comprising:

receiving an optical data stream including multicast traffic;

terminating the optical data stream; and

routing the multicast traffic using a predetermined multicast routing mechanism.

38. The method of claim 37, wherein receiving the optical data stream including multicast traffic comprises:

receiving the optical data stream over an incoming optical fiber.

39. The method of claim 38, wherein terminating the optical data stream comprises:

dropping the optical data stream from the incoming optical fiber; and

converting the multicast traffic from an optical form into a digital form suitable for routing.